REMARKS

Claims 1-19 have been elected orally and provisionally on 12 Dec. 2005, based on Examiner's oral Election/Restriction Request. This oral election of claims 1-19 is herewith confirmed. Claims 1-19 are being considered upon entry of this amendment.

Claims 1 and 15 have been amended to incorporate the respective features of claims 5 and 18, now cancelled.

1. Claim Rejections

Claims 1-4, 6-12, 14-17 and 19 stand rejected under 35 USC §102 based on *Kikawa et al.* The remaining claims 5, 13, and 18 stand rejected under 35 USC §103 based on *Kikawa et al.* Applicants respectfully traverse these rejections for at least the following reasons.

Kikawa et al. (US patent 6 455 876) was filed on 20 August 2001.

The present application US 2004/0151226 is a CIP of US 2002/0191660 that in turn is based on Provisional application No. 60/293 738, filed on 25 May 2001, i.e. before the filing date of *Kikawa et al.*

In the following, it will be shown that the present invention as claimed in amended claims 1 and 15

(1) is not disclosed in *Kikawa et al.*, despite the fact that the Kikawa patent shows one embodiment of some similarity.

(2) was adequately disclosed in the Provisional application No. 60/293 738, which antedates *Kikawa et al.*

Ad (1)

This section concerns and describes the differences between an anti-reflection coating (subject of the present invention) and high-reflection multilayer coatings (main subject of *Kikawa et al.*).

The invention described by *Kikawa et al.* mainly deals with Si:H(N) layers used in multilayered high-reflection mirror coatings, i.e. coatings for the rear mirror of the laser, not the emitting facet. One exception is the described anti-reflection coating for DFB lasers (wavelength 1537 to 1562 nm), discussed further below.

The layers described by *Kikawa et al.* are generally not suited for antireflection coatings, i.e. front or emitting facet coatings, of high power laser diodes. This is because the material properties of the described layers do not necessarily fulfill the requirements needed for a reliable long-term operation of a laser. For a high power laser, the requirements on the stability of materials for a front facet anti-reflection coating differ significantly from the requirements for a high-reflection rear coating; they are much higher for a front/emitting facet coating because the optical power density in an anti-reflection coating at the front facet is typically two orders of magnitude larger than in a high-reflection rear coating. This renders the front facet coating of a semiconductor laser much more susceptible to catastrophic optical damages (CODs).

The above-mentioned "exception" in *Kikawa et al.* is Fig. 6, showing and describing an anti-reflection multilayer structure with an Si:H(N) layer at the front or emitting facet. (There are single-layer front facet embodiments shown in Figs. 3 and 5, but they are unrelated because they use Al_2O_3 material and not Si:H(N)).

Looking at this Fig. 6 embodiment of *Kikawa et al.*, the person skilled in the art recognizes some significant differences compared to the present invention:

(a) There is a structural difference:

In *Kikawa et al.*, the Si:H(N) layer is not the outermost layer, but covered by a SiO_2 layer with a lower refractive index than the Si:H(N) layer in order to reach the desired low refractive index for the multilayer structure.

In the present invention in contrast is the SiN_x:H material always the outermost layer (and usually a single layer). The refractive index of the SiN_x:H layer is the desired refractive index of the entire anti-reflection mirror coating.

(b) There is a difference in materials:

In *Kikawa et al.*, the material is Si:H(N), i.e. a so-to-speak "nitrogenized Si:H", wherein the N:H:Si ratio is preferably 1 : 2 : 10.

The present invention in contrast uses an SiN_x material, wherein the Si/N ratio determines the refractive index. The N:H:Si ratio varies between approximately 1 : 0.25 : 0.3 and 1 : 0.5 : 1.5.

(c) There is a difference in power levels and associated CODs:

The optical output power density of DFB lasers as in *Kikawa et al.*'s Fig. 6 is in the range of 100kW/cm^2 or less. The high power laser according to the present invention produces an output power density of 1-10 MW/ cm^2.

In 15XXnm InP-based semiconductor lasers, especially DFB lasers, according to Kikawa, CODs are not known to be a critical issue. This is in contrast to GaAs-based 9XXnm high power lasers typical for the present invention, where CODs are a very critical issue.

To summarize, *Kikawa et al.* does not teach the present invention.

Ad (2)

The prior Provisional application 60/293 738, which antedates *Kikawa et al.*, claims a $SiN_xO_yN_y$:H material, i.e. a material with an oxygen component. However, the embodiment described in this Provisional application does not contain such an oxygen component.

In detail: Starting from page 5 of the 12-page description of the Provisional, there is no mentioning of an oxygen component any more. In fact, only the preparation and the properties of SiNx:H layers are described in the detailed description of the invention. In particular, all investigations described in the provisional applications were performed using SiNx:H coating layers and PECVD processes with oxygen-free precursor gases.

Thus it is not only obvious, but absolutely clear to a person skilled in the art that the described front facet coating does not need to contain oxygen. In other words, the present invention is already sufficiently disclosed to the person skilled in the art in the prior provisional application which antedates *Kikawa et al.*

To summarize, *Kikawa et al.* is an invalid reference.

2. Claim amendments

Amended claim 1 now includes the feature from claim 5; claim 15 correspondingly the feature from claim 18. This feature concerns the range for the Si/N ratio applicable to the present invention. This range is not disclosed by *Kikawa et al.*

Further, to render the independent claims more concise, the feature that the refractive index is essentially determined by the Si/N ratio in and/or the microstructure of said SiN_x:H layer was limited to the Si/N ratio.

3. Conclusion

Accordingly, all presented claims are believed to be allowable and the application is believed to be in condition for allowance. A prompt action to such is respectfully solicited.

Should the Examiner feel that a telephone interview would help to facilitate favorable prosecution of this application, Examiner is respectfully invited to contact the undersigned at the phone number below.

Should a petition for an extension of time be necessary for the timely reply to the outstanding Office Action (or if such a petition has been made and an additional extension is necessary), petition is hereby made and the Commissioner is authorized to charge any fees (including additional claim fees) to Deposit Account No. 18-0988.

Respectfully submitted,

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